



# Risk factors associated with parents claiming personal-belief exemptions to school immunization requirements: Community and other influences on more skeptical parents in Oregon, 2006<sup>☆</sup>

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## ARTICLE INFO

### Article history:

Received 31 January 2011

Received in revised form

30 September 2011

Accepted 3 December 2011

Available online 14 December 2011

### Keywords:

Immunization exemptions

Personal-belief exemptions

Religious exemptions

Immunization

Anti-vaccine

Vaccine-hesitant

Vaccine-concerned

## ABSTRACT

**Background and objectives:** With vaccine-preventable diseases at record lows, few studies investigate rising parent-claimed exemptions to school immunization requirements. After finding exemption clusters in Oregon, we hypothesized that exemption risk factors may vary among communities. We surveyed parents to identify risk factors for exemptions and evaluated risk factor differences among communities with differing exemption rates.

**Design:** Retrospective cohort study, multi-staged, population-proportionate sampling.

**Setting and participants:** Parents of 2004–05 Oregon elementary school children ( $N = 2900$ ).

**Main outcome measure:** Parent-reported exemption status.

**Results:** The response rate was 55%. Compared to vaccinators, exemptors were significantly more likely to have: strong vaccine concerns (weighted adjusted odds ratio (aOR) = 15.3, 95% CI 6.4–36.7); “vaccine-hesitant” concerns (aOR = 2.3; 95% CI 1.0–5.0); >1 childbirth(s) at a non-hospital, alternative setting (aOR = 3.6; 95% CI 1.6–8.0); distrust of local doctors (aOR = 2.7; 95% CI 1.0–7.5); reported chiropractic healthcare for their youngest school-age child (aOR = 3.9; 95% CI 1.8–8.5); and reported knowledge of someone with a vaccine-hurt child (aOR = 1.8; 95% CI 0.9–3.4). Exemptors were less likely to have “pro-vaccine” beliefs (aOR = 0.2; 95% CI 0.0–0.6) and less likely to report relying on print materials (aOR = 0.4; 95% CI 0.2–0.8).

The strengths of association differed significantly for those with strong vaccine concerns and those reporting knowledge of someone with a vaccine-hurt child, depending on residence in exemption-rate areas, e.g., exemptors in medium-rate areas were more likely to have strong vaccine concerns (aOR = 13.5; 95% CI 5.4–34.0) than those in high-rate areas (aOR = 9.7; 95% CI 3.7–25.4).

**Conclusions:** Vaccine beliefs were important risk factors. That differing community-level exemption use modified the effects of several individual-level factors suggests that communities also influence parent decisions. Therefore, understanding community contexts and norms may be important when designing interventions.

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**Abbreviations:** OR, Oregon; CDC, Centers for Disease Control and Prevention; CI, 95% confidence interval; RR, relative risk; OR, odds ratio; aOR, adjusted odds ratio.

<sup>☆</sup> Earlier analyses presented at the American Public Health Association 135th Annual Meeting, Washington, DC, November 2007, the 41st National Immunization Conference (NIC), Kansas City, Kansas, March 5–8, 2007, the Northwest Immunization Conference, Portland, Oregon, May 15–16, 2007, the American Public Health Association 134th Annual Meeting, Boston, MA, November 2006 and the 40th National Immunization Conference (NIC), Atlanta, Georgia, March 6–9, 2006.

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## 1. Introduction and background

Vaccine-preventable diseases (VPDs) among US children are at record lows—a major public health achievement [1]. An important VPD prevention strategy involves school immunization requirements in all U.S. states, proven effective in strengthening rates of vaccine coverage and in controlling outbreaks [2–7]. Even so, debates about balancing personal rights and state authority regarding requirements for immunization are longstanding [8–15]. Indeed, 48 states allow exemptions to immunizations for medical, religious, or philosophical reasons, but legal definitions and enforcement differ [2,16]. By Oregon law, “religious” exemptions are allowed for any system of beliefs, practices, and ethical values [17].

Between 1994 and 1996, based on annual school surveys in 48 states, the average exemption rate was 0.58%, and studies have indicated generally high vaccine coverage among school children [2,18,19]. However, media reports, web sites, and discussions about parents' growing concern about vaccines have proliferated [20–24]. Moreover, some parents may be taking action: states report increases in what is termed “personal belief” exemptions [13,25–29]. Oregon exemption rates climbed from 2.8% in the 2003–04 school year to close to 5% by the 2008–09 school year, well above the average rate of 0.58% [2]. Increasing exemption rates signal possible setbacks in public health, yet few studies have investigated this increase, hindering efforts either to understand or respond to these rising rates. Some studies have begun to explore the complexities.

### 1.1. Clustering of exemptions to immunization requirements

One issue involves clustering of exemptions, proposed by May and Silverman and documented elsewhere [16,29–38]. DeBolt et al. identified geographical exemption clusters in King County, Washington, associated with higher rates of pertussis [31]. In Oregon, we mapped areas by exemption rates and found clusters with high rates [32]. Adjusting for population characteristics, Omer et al. found that census-tract-level exemption rate clusters were highly correlated with pertussis case clusters in Michigan [16]. Smith et al. demonstrated that un-immunized children cluster geographically, especially in the western U.S., with Oregon having the third highest rate of un-immunization in the U.S. [39].

### 1.2. The ease or difficulty of parents getting exemptions to requirements

Rota et al. found that ease in obtaining exemptions was associated with rates of state-level exemptions [2]. Salmon et al. suggested that the attitudes and beliefs of school nurses and personnel and the convenience of obtaining exemptions influence the choice to get an exemption [40]. How important this convenience is as a risk factor remains unclear.

### 1.3. Parents' attitudes and beliefs about immunization

Studies have also assessed parents' attitudes about issues related to vaccines and about school requirements for vaccination but not as risk factors for exemption [41–60]. While documenting that some parents have concerns or unfavorable beliefs about vaccines, most quantitative studies lack adequate sample sizes to clarify concerns among sub-groups. In a qualitative study, Benin et al. described postpartum mothers' attitudes about vaccination on a continuum, including “vaccine-hesitant” mothers with significant concerns who nonetheless accepted vaccination and mothers who rejected vaccinations [45]. Domains associated with decisions about vaccination included sources of information and beliefs and attitudes about vaccines [45]. Finding 6 clusters of vaccine beliefs held by parents, Gust et al. explored differences among parents with opposing beliefs about vaccine efficacy and about the benefits and risks of vaccination, and correlated parents' low confidence in vaccine safety with low compliance with their child's doctor's advice [46,47]. Gust et al. estimated that 28.2% of U.S. parents of two-year-olds expressed doubts about vaccines [57]. They found that concern about vaccine safety was a key risk factor among doubters, especially among the 6% of parents who refused vaccinations for their children [57].

### 1.4. Studies of risk factors for exemptions to immunization requirements

Recent U.S. studies have directly examined risk factors for exemption [33,34,58,60]. These factors include parents' perception of the high risk of vaccines versus the low benefit of vaccination; involvement with alternative healthcare providers; and distrust of government and allopathic medical providers. Parents' perceptions of low safety and efficacy of vaccines, low susceptibility to and severity of disease, and low trust in government, but not low trust in healthcare providers, were independent risk factors for exemption in multivariable analyses [58]. Factors from unadjusted analyses included agreement with unfavorable beliefs about vaccines, disagreement with favorable statements about vaccines, and only certain sources of information about vaccination—e.g., positive ratings of information from alternative healthcare professionals and the internet [58]. In one Oregon community with a high exemption rate, Robison et al. also associated exemptions with parents' perceptions of proximity to children harmed by vaccines and with recall of discussions about immunization with healthcare providers [33,34]. These studies looked only at the association of each statement of attitudes or beliefs about vaccination with exemptions but not at how these attitudes and beliefs together influence parents' choices.

### 1.5. The role of healthcare providers in parent immunization decisions

The role healthcare providers play in decisions about exemption has not been well studied, although a comprehensive review of studies demonstrated the importance of provider-related factors for child under-immunization, and Salmon et al. found that providers of exempt children differed in some attitudes about vaccination from providers of non-exempting children [61,62]. Certainly, both allopathic and alternative providers participate in the debate about vaccines and school requirements, but their influence remains unclear [21,63–72]. Sentiments about the government or medical establishment, about trust in information from such authorities, and about community-level factors have also not been directly studied [21–23,41–44,66,73].

To further our understanding of exemption clusters and risk factors in Oregon [29], we hypothesized that risk factors for exemption may vary among communities. The purposes of these analyses are: (1) to identify factors associated with exemptions, especially combinations of parents' attitudes and beliefs about vaccination, and (2) to evaluate differences in risk factors among communities with varied exemption rates.

## 2. Methods

### 2.1. Data sources and survey sampling and collection methods

To examine whether exemption risk factors vary among communities, we surveyed parents to identify risk factors for exemptions and evaluated risk factor differences among communities with differing exemption rates. We conducted a retrospective cohort study of parents of elementary school-age children during the 2004–2005 school year using multi-staged, population-proportionate sampling. Public and private elementary school lists were compiled from Oregon's Department of Education information, internet searches and telephone directories. High School-Based Community Areas were defined by the Department of Education as the areas served by high schools where graduating elementary-school students are referred. Considering population density, we assigned schools and Community Areas to 7 census-based “locales,” from large city to rural. Using school-level

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